WiTricity Corporation

149 Grove St., Watertown, MA 02472 USA
617-926-2700 | 617-926-2745 www.witricity.com

November 21, 2011

DOCKET
11-AAER-2
DATE Nov. 21 2011
RECD. Nov. 21 2011

Via Overnight Mail and E-Mail
California Energy Commission
Docket No. 11-AAER-2
Docket Unit
1516 Ninth Street, Mail Station 4
Sacramento, CA 95814-5504

Email: Docket@energy.state.ca.us

Re: Notice of Proposed Action—Proposed Amendments To Appliance Efficiency Regulation (e.g. Battery Charger Systems)—CEC Docket No. 11-AAER-2

Dear Madam/Sir:

WiTricity Corporation respectfully submits these comments in response to the California Energy Commission's ("Commission") "*Notice of Proposed Action in Docket Number 11-AAER-2, Proposed Amendments to Appliance Efficiency Regulations*" ("proposed regulations"), specifically the proposed regulations for battery charger systems.

WiTricity Corporation applauds and supports the Commission's goal to "reduce wasteful, uneconomic, inefficient, or unnecessary energy use" and believes that "prescribing, by regulation, standards for minimum levels of operating efficiency for appliances" is one way to achieve the goal. Furthermore, for the four categories of battery charger systems considered within the scope of the regulation, WiTricity agrees that "technology-neutral" regulations are adequate for specifying limits on operating efficiency and unnecessary energy use.

However, there is a new type of wireless charging appliance that is not yet on the market, and whose operation and benefits to the consumer are significantly different than those of the four categories of battery chargers explicitly stated as within the scope of the proposed regulation. Given the novelty of these wireless battery charger systems, and their yet unproven impact on overall energy consumption, WiTricity Corporation respectfully requests that the Commission explicitly exclude these charger systems from the proposed regulations until such time as their benefits and costs can be accurately assessed. At that time, the Commission should determine

whether these novel battery charger systems are within the scope of the proposed regulations and should be held to the same "technology-neutral" standards, or whether additional and/or alternative measures of energy efficiency should be specified for these new systems.

Novel Wireless Battery Charger Systems

The novel wireless battery charger systems referred to above are based on technology invented at the Massachusetts Institute of Technology and often referred to within the industry as "highly resonant" or "near-field magnetic resonance" wireless power systems. Sometimes, these highly resonant wireless power systems are also referred to as "loosely-coupled", when compared to "tightly-coupled" or traditional inductive chargers such as the "inductive charger systems" mentioned in the proposed regulations. The Consumer Electronics Association (CEA) is developing standards for these highly resonant "Small Battery Charger Systems"[1] and the Society of Automotive Engineers (SAE) is working to set interoperability standards for "Large Battery Charger Systems"[2]. Other commissions such as the International Electrotechnical Commission (IEC) are involved in developing standards for highly resonant wireless power transfer systems across a wide range of power levels[3] [4].

Highly resonant wireless battery charger systems will implement many of the energy saving technologies described in the proposed regulations. For example, we expect the "hysteresis capability", switch mode power supplies, and charge regulating elements will be standard in all highly resonant wireless charger systems. In addition, the new operating modes and operational advantages of these novel chargers may motivate alternative energy efficiency considerations, not contemplated in the currently proposed regulations.

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[1] http://www.y-adagio.com/public/committees/iec_tc100_ags/meetings/29/100ags435.pdf

[2] http://standards.sae.org/wip/j2954

[3] http://www.iec.ch/dyn/www/f?p=103:14:0::::FSP_ORG_ID,FSP_LANG_ID:8538,25

[4] Excerpted from a presentation at the October 29th, 2011 meeting of the IEC TC100 (Technical Committee no. 100: Audio, Video and Multimedia Systems and Equipment) in Melbourne, Australia, with permission:

Wireless power transmission is an emerging technology and market for the IEC TC100

Proposed scope (for a New Technical Report)

Information about wireless power transmission research and applications. Information about the regulatory environment for wireless power transmission. Observations and recommendations about the potential, future standardization with the scope of the IEC TC100.

Proposed Timeline

Draft 1.0 of the Working Draft: due in June 2012 for Project Team members review

The Proposed Project was approved and has been started, with a face to face meeting of members of TC100/Wireless Power taking place in San Jose, CA in December 2011.

For example, highly resonant wireless battery chargers can use a single switch mode power supply to charge multiple battery packs simultaneously. Efficiency advantages associated with this novel multi-battery charger capability include reduced "stand-by" power and higher overall transfer efficiency.

- Rather than multiple battery packs requiring their own charging cord and/or charging circuit, each of which draws its own "maintenance mode power" and "no battery mode power", a single (one) highly resonant power supply can be used to charge multiple battery packs.
- Unlike multi-port wired chargers that split the supplied power to a predetermined number of ports, highly-resonant wireless chargers can adjust their power draw to charge a changing number of battery packs.
- In addition, highly-resonant power supplies can adjust their power draw to charge battery packs with different charge capacities, charging rates, charging profiles, etc.
- Highly resonant power supplies become more efficient as they charge more battery packs because the ratio of useful charge power to parasitic losses in the switch mode power supply increases.
- An addition benefit of highly resonant wireless battery charger systems is that battery packs do not need to be removed from the devices they are powering in order to be recharged. Rather, devices with rechargeable batteries may be placed anywhere in a charging region, and their batteries may be recharged using a highly resonant power supply as described above.

The convenience of charging multiple battery packs by just placing consumer devices (alone or in sleeves, belt clips, bags, backpacks, etc.) in the near-field region of a wireless power supply is expected to make rechargeable batteries so much more reliable that they displace the use of disposable batteries in devices such as wireless keyboards, mice, cameras, navigational devices, etc. Billions of disposable batteries are produced, transported, sold and thrown away each year. Each disposable AA battery avoided saves the green house gas equivalent of driving a car 1.2 miles, or 1.3 lb CO_2 per battery. Reducing the consumption of disposable batteries may not impact "charging efficiency" as defined in the proposed regulation, but surely must be considered in a unified energy conservation policy.

Summary

In summary, WiTricity Corporation respectfully requests that the California Energy Commission explicitly exclude highly resonant wireless battery charger systems from their proposed

amendments to the "Notice of Proposed Action in Docket Number 11-AAER-2, Proposed Amendments to Appliance Efficiency Regulations", at least until these novel wireless battery charger systems have had a chance to be commercialized and their overall environmental benefits and costs are accurately assessed. Highly resonant wireless battery charger systems offer a host of new operating modes and operational advantages over traditional wired and inductive chargers that may prove to improve energy efficiency in ways not contemplated by the proposed regulations.

Respectfully submitted,

Dr. Katherine L. Hall
Chief Technology Officer
WiTricity Corporation

Cc: Harinder Singh via e-mail hsingh@energy.state.ca.us
Kenneth Rider via e-mail krider@energy.state.ca.us

About WiTricity

WiTricity Corporation was founded in 2007 to commercialize and continue development of an exciting new technology for wireless power transmission invented at the Massachusetts Institute of Technology (MIT) by a team of physicists, led by Professor Marin Soljačić. Soljačić's team showed that specially designed magnetic resonators configured as wireless power sources and capture devices could efficiently transfer power over large distances via the magnetic near-field. Their first published demonstration of wireless power transfer showed a 60 watt light bulb being illuminated from a power source over 2 meters away, and their results were published in the prestigious journal *Science* in July 2007. This demonstration achieved broad media attention when it was announced, indicating both the intense public interest and commercial need for wireless power transfer. Prof. Soljačić was recognized with a MacArthur Fellowship (also known as "Genius Grant") in September 2008, awarded by the John D. and Catherine T. MacArthur Foundation. In addition, his work was recognized as one of the "Top Ten Emerging Technologies for 2008" by Technology Review, "Top 100 Science Stories of 2007" by Discover Magazine, and cited in The New York Times Magazine: "The Year in Ideas – 2007."

WiTricity Corporation has received multiple awards, including awards for developing technology that will make "our world into a cleaner, healthier, more efficient place"[5] and for "improv[ing] the energy efficiency of buildings"[6]. WiTricity's patent portfolio includes multiple issued patents and many more pending patent applications, many of which are related to highly resonant wireless battery chargers.

WiTricity Corp.'s vision is to develop a family of highly resonant wireless power systems and components that will enable OEM's in a broad range of industries and applications to make their products truly "wireless", with power delivered safely and over room scale distances.

[5] http://alwayson.goingon.com/AOStory/GoingGreen-East-Top-50-Companies-0

[6] http://www.businessweek.com/news/2011-06-23/ge-awards-63-million-to-10-solar-home-efficiency-startups.html